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Section 12
State Water Plan, Utah Lake Basin

Water Quality

With some exceptions, groundwater in the Utah Lake Basin is good quality and suitable for culinary use with little treatment. Most surface water is also of high quality if diverted before it reaches Utah Lake.

12.1 Introduction

This section presents data and information on existing levels of water pollution throughout the Utah Lake Basin. Sources of pollution are identified, problems and solutions are discussed, and a recommendation is given for control and improvement by responsible agencies.

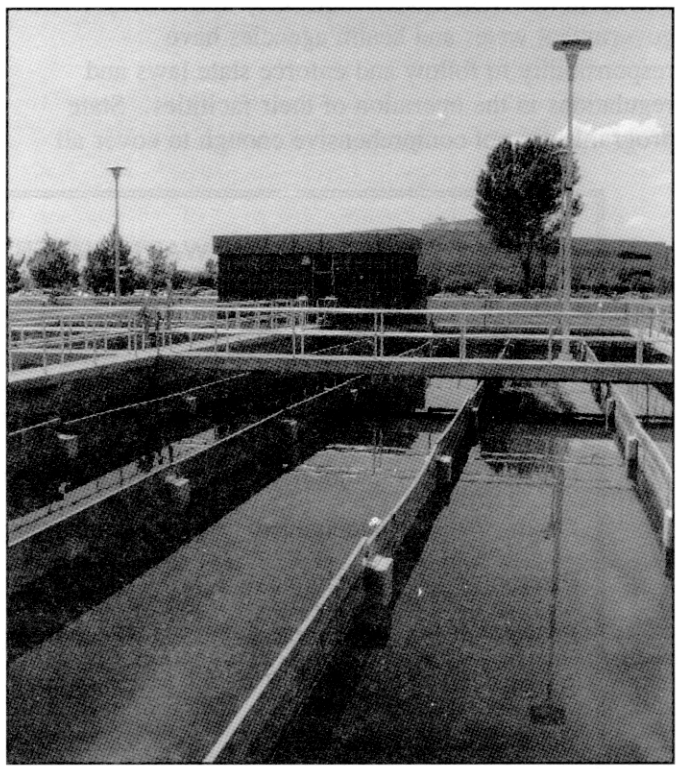
12.2 Setting

Above the mouths of their respective canyons, American Fork River, Provo River and Hobble Creek have TDS concentrations averaging less than 300 mg/l. Standards for coliforms, iron and manganese are sometimes violated in the Provo River. The Spanish Fork River above the canyon mouth has lower water quality than the others. Standards are occasionally not met for iron and manganese but TDS is generally less than 500 mg/l.

Diamond Fork has better quality water than the Spanish Fork River above their confluence. Water in the upper part of Diamond Fork is of excellent quality, as is the water imported through the Strawberry Tunnel, both with an average TDS of around 200 mg/l. In the lower reaches of Diamond Fork, TDS averages less than 300 mg/l, although secondary standards for iron and manganese are occasionally exceeded. Farther to the south in Juab County, Salt Creek has TDS values more than 600 mg/l and Currant Creek, which flows out of Mona Reservoir into Goshen Valley, has TDS values of about 950 mg/l.

As streams progress farther out into the valley and toward Utah Lake, their water quality deteriorates because of return flows and outflow from shallow aquifers. In northern Utah Valley (from Hobble Creek northward), TDS levels of the streams and return flows range from 300 to 600 mg/l where they enter Utah Lake. The Spanish Fork River has TDS values between 280 and 2,760 mg/l with an average of 600 mg/l at its mouth. Inflows to Utah Lake from Goshen Valley (White Lake) average about 4,000 mg/l. TDS values measured for mineralized springs discharging into Utah Lake have ranged from 1,000 to 28,000 mg/l. The average TDS of all inflows to Utah Lake is about 625 mg/l.

Evaporation from Utah Lake further increases salinity and lowers water quality. Because the lake is shallow, waves disturb the bottom sediments and keep the water turbid. Many water quality standards are consistently exceeded.



Provo City Water Reclamation Plant

The Jordan River, which drains Utah Lake into Salt Lake County and the Great Salt Lake, has TDS values ranging from 800 to 1,200 mg/l and average about

1,125 mg/l. This is not suitable for culinary uses without expensive treatment. It is only suitable without treatment for most agricultural uses. The Salt Lake County Water Conservancy District has studied this water and plans to treat it for M&I use by year 2010.

12.3 Organizations and Regulations

Maintaining water quality requires the cooperation of a wide range of public and private interests. The responsibility for providing leadership falls mostly on local government agencies, subject to state and federal regulatory programs.

12.3.1 Local

The Mountainlands Association of Governments plays a key role in coordinating local initiatives to improve water quality, but it has no regulatory powers. Currently it is participating with the Division of Water Quality (DWQ) in a watershed study to improve water quality in the Utah Lake Basin. City and county government water and health agencies have responsibility to follow and enforce state laws and regulations in the operation of their facilities. State programs are not comprehensive enough to cover all sources of groundwater contamination. The many activities leading to groundwater pollution make it difficult to maintain high quality water supplies. Local government agencies take an active role in protecting wells, springs and recharge areas, and in treating waste water. Table 12-1 shows the major wastewater facilities operated by local agencies.

12.3.2 State

Under the Utah Water Quality Act, the Division of Water Quality (DWQ), Department of Environmental Quality (DEQ) is responsible for adopting, enforcing and administering state and federal water quality regulations. Their charge is to maintain acceptable levels of water quality since population growth will require more high quality water. Increasing numbers of people mean more recreational activity will add pollution to surface streams and storage reservoirs. This will require water quality agencies to work closely with water rights administrators.

The Clean Water Act gives responsibility to the state DEQ for the enforcement of regulations dealing with point source discharges. These regulations

Table 12-1
WASTEWATER TREATMENT FACILITIES

City	Type	Disposal Method	Design Capacity (mgd)	Design Capacity (ac-ft/day)	Current Average Flow (mgd)	Volume (ac-ft/day)
Nephi	Lagoon	Total Containment	2.00	6.14	0.26	0.80
Orem	Mechanical	Discharging	12.30	37.75	7.94	24.37
Payson	Mechanical	Discharging	1.25	3.84	0.81	2.49
Provo	Mechanical	Discharging	21.00	64.45	15.66	48.06
Salem	Lagoon	Discharging	1.50	4.60	0.71	2.18
Spanish Fork	Mechanical	Discharging	5.00	15.34	2.64	8.10
Springville	Mechanical	Discharging	6.48	19.89	3.03	9.30
Heber Valley	Lagoon	Land Application	2.50	7.67	1.22	3.74
Timpanogos	Mechanical	Discharging	7.60	23.32	5.91	18.14
Total			59.63	183.00	38.18	117.18

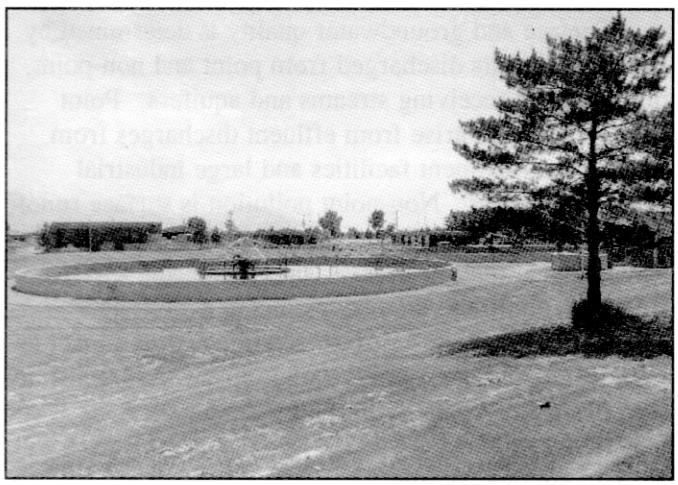
require: "... the discharge of any pollutant directly into the waters of the United States from a new or existing point source is prohibited unless the point source has a valid and active National Pollutant Discharge Elimination System (NPDES) permit."

Limits on loading rates of various pollutants are usually established by state agencies with consideration given to Environmental Protection Agency (EPA) guidelines. However, state agencies can adopt more stringent limits. Wastewater treatment plants and/or industrial businesses discharging pollutants into Utah waters are issued a Utah Pollutant Discharge Elimination System (UPDES) permit. These permits are valid for five years and must be renewed with a re-evaluation of pollutant limitations.

Enforcement of NPDES/UPDES permit requirements is accomplished by effluent monitoring programs supervised by the Division of Water Quality. Seven wastewater treatment facilities currently discharge secondary effluent to surface water systems. Besides domestic wastewater, there are 18 industrial firms requiring UPDES permits to discharge point source pollutants into surface waters.

A *Clean Lakes Diagnostic Feasibility Study* has recently been completed for Utah Lake. The study, funded under Section 314 of the Water Quality Act, assesses the lake's water quality and suggests what can be done to improve it.

Department of Agriculture - The Environmental Quality Section of the Utah Department of Agriculture carries out Utah's non-point water pollution control and prevention program administered by the Division of Water Quality. This is partially funded through federal grants from the EPA and partially supported by matching funds from state and local agencies and private sources. The program is divided into several parts: watershed management projects, groundwater monitoring, and information and education. Public information programs use newsletters, brochures, videos and slide shows, and extend to public schools and adult education.



Payson Water Reclamation Plant

Department of Environmental Quality - The DEQ developed a Groundwater Quality Protection Strategy for the State of Utah based on an executive order issued in 1984 by the governor. Groundwater discharge permits are required for activities that may affect these waters. The DWQ has also established stream classifications for surface streams in Utah based on anticipated uses. Table 12-2 shows the current water quality classes for the major water storage facilities. Table 12-3 shows the classification of streams in the Utah Lake Basin. Stream reaches can have more than one classification.

12.3.3 Federal

Congress passed the federal Water Pollution Control Act in 1972 to establish regulatory programs to improve the quality of the nation's waters. The act was amended in 1977 and became known as the Clean Water Act (CWA). Additional amendments were made in 1987.

The CWA amendments provide regulations to deal with the growing national toxic water pollutant problem, and further to refine the EPA's enforcement priorities. The amendments substantially increased the EPA's authority to enforce all water quality regulations associated with new federal mandates to clean up the nation's streams, rivers, reservoirs and lakes.

In the mid-1950s, the federal government began offering funding programs to state water pollution control agencies to help in the ongoing construction of wastewater treatment facilities. These early grants provided funding to pay for 30 to 55 percent of the total construction costs. This source of federal funds, along with monies provided through the Utah Water Pollution Control Act (UWPCA), helped to finance most wastewater treatment facilities.

From 1972 to 1989, more than $50 million in EPA grants have been spent to construct or enlarge wastewater treatment and collection facilities throughout the Utah Lake Basin. Towns, cities, rural communities

Table 12-2
SURFACE STORAGE CLASSIFICATIONS

Lakes	Classes				
Deer Creek Reservoir	1C	2A	2B	3A	4
Mona Reservoir		2B	3B	4	
Salem Pond		2B	3A	4	
Silver Lake Flat Reservoir		2B	3A	4	
Tibble Fork Reservoir		2B	3A	4	
Utah Lake		2B	3B	3D	4
Jordanelle Reservoir(Preliminary)	1C	2A	3A	4	

1C Protected for domestic purposes with prior treatment by processes as required by the Utah Department of Health.
2A Protected for primary contact recreation such as swimming.
2B Protected for secondary contact recreation such as boating, wading or similar uses.
3A Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
3B Protected for warm water species of fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
3D Protected for waterfowl, shore birds and other water oriented wildlife not included in 3A, 3B or 3C, including the necessary aquatic organism in their food chain.
4 Protected for agriculture uses, including irrigation of crops and stock watering.

and some sewer improvement districts have all benefited from this federal funding.

By 1990, federal expenditures for public works drastically decreased and most grant programs for construction and upgrades were eliminated. Now, federal wastewater treatment funding is only available through revolving loan programs administered by the Division of Water Quality (DWQ). Expenditures in the Utah Lake Basin have averaged nearly $2.8 million per year for new construction.

The federal government also funds many water quality projects through the Superfund Cleanup Program. The primary agencies involved in water quality issues are the Bureau of Reclamation, U.S. Geological Survey and Environmental Protection Agency.

Federal standards for solid waste and hazardous material are set forth under the Comprehensive Environmental Response and Comprehensive Liability Act (CERCLA). The EPA regulates these standards, and compliance is verified through local health department monitoring programs.

The U.S. Geological Survey started the Great Salt Lake National Water Quality Assessment (NAWQA) study in October 1996. The federal government funds the program and includes the drainage basins of the Bear, Weber, and Jordan rivers. The long-term goals of the NAWQA program are to describe the status of and trends in the quality of a large representative part of the nation's surface and groundwater resources. The program is intended to produce a wealth of water-quality information useful to policy makers and managers at the federal, state and local levels.

12.4 Water Quality Problems

Surface and groundwater quality is determined by the contaminants discharged from point and non-point discharges to receiving streams and aquifers. Point source problems arise from effluent discharges from wastewater treatment facilities and large industrial processing plants. Non-point pollution is surface runoff generated from agricultural, municipal and industrial activities and other sources. Runoff entering surface streams from urban land development is no longer considered non-point source discharge and is subject to UPDES regulations. Boats dumping sewage are also a significant water quality problem.

12.4.1 Surface Water

Urbanization of the Utah Lake Basin has increased the discharge of domestic and industrial wastewater to local streams. Table 12-4 lists the point sources in the

Table 12-3
SURFACE WATER CLASSIFICATIONS

Streams	Classification				
Jordan R. Utah Lake to Jordan Narrows/Turner Dam	1C				
Provo R. and tributaries, Utah Lake to Murdock Diversion		2B	3A		4
Provo R. and tributaries, Murdock Diversion to headwaters	1C	2B	3A		4
Upper Falls above Provo City Diversion	1C	2B	3A		
Bridal Veil Falls above Provo City Diversion	1C	2B	3A		
Lost Creek and tributaries, above Provo City Diversion	1C	2B	3A		
American Fork R. and tributaries, mouth of American Fork R. to headwaters		2B	3A		4
Spanish Fork R. and tributaries, Utah Lake to Moark Diversion		2B	3B	3D	4
Spanish Fork R. and tributaries, Moark Junction to headwaters		2B	3A		4
Spring Creek and tributaries, Utah Lake. near Lehi to headwaters		2B	3A		4
Lindon Hollow Creek and tributaries, Utah Lake to headwaters		2B	3B		4
Mill Race and tributaries from Utah Lake to headwaters		2B	3B		4
Mill Race, Interstate 15 to Provo City WWTP discharge		2B	3B		4
Spring Creek and tributaries, Utah Lake to Industrial Parkway Road		2B	3B		4
Spring Creek tributaries, Springville WWTP, w/effluent		2B		3D	4
Spring Creek and tributaries, 50' from Industrial Parkway to headwaters		2B	3A		4
Ironton Canal, Utah Lake to D&RGW RR right-of-way		2B	3C		4
Ironton Canal, D&RGW to diversion from Spring Creek		2B	3		4
Hobble Creek and tributaries, Utah Lake to headwaters		2B	3A		4
Dry Creek and tributaries, Utah Lake to Interstate 15		2B	3C		4
Benj. Slough and tributaries (ex. Beer Creek), Utah Lake to headwaters		2B	3B		4
Beer Creek from 4850 West to headwaters		2B	3C		4
All other permanent streams entering Utah Lake		2B	3B		4
Salt Creek, Nephi diversion to headwaters		2B	3A		4
Currant Creek, Mona Reservoir to mouth of Goshen Canyon		2B	3A		4
Burriston Creek, Mona Reservoir to headwaters		2B	3A		4
Peteetneet Creek and tributaries, irrigation diversion Maple Dell to headwaters		2B	3A		4
Summit Creek and tributaries, USNF boundary to headwaters		2B	3A		4
Rock Canyon and tributaries, USNF boundary to headwaters	1C	2B	3A		4
Dry Creek and tributaries, USNF boundary to headwaters		2B	3A		4

Utah Lake watershed that have discharge permits and are monitored by the Division of Water Quality.

One great concern is the pollution occurring at sites associated with water-based recreation. Deer Creek and Jordanelle reservoirs are primary examples. Activities at these sites that pollute the drinking water include vehicles parked on the beaches, boats that leak oil, dogs, inadequate sanitary facilities, and cattle and wildlife grazing in nearby watersheds.

A second concern is the increase in volume of storm water into the Provo Reservoir Canal and other streams, along with sediment deposition and other pollutants. Provo has created a storm drainage district to control storm runoff and mitigate water quality deterioration from these sources. Orem is doing the same. The primary concern is with phosphorus exceeding standards basin-wide. The Provo River Water Users Association, Bureau of Reclamation and Utah Division of Parks and Recreation are working together to minimize these water quality impacts.

Table 12-5 shows the current impairments to water quality in the Utah Lake Basin and the percentage for each. Table 12-6 shows sources of impairments.

Utah Lake is a shallow lake which averages 9.4 feet in depth. Sediments on the bottom of the lake are very fine particles, principally calcium carbonate, which are stirred from the bottom as the wind blows. This causes the lake to exhibit a noticeable turbidity which the public perceives as a serious pollution problem.

Table 12-4 POINT SOURCES
Source
Payson
Salem
Spanish Fork
Springville
Provo
Springdell
Orem
Timpanogos Special Service District
West Utah Lake SSD
Pacific States
Reilly Industries
Geneva Steel
A.P. Green Refractories
Payson Power
Springville Fish Hatcheries
United Park City Mines
Midway Fish Hatchery
Nephi Rubber
Source: *Phase I: EPA Clean Lakes Study*, June 1996.

Table 12-5 IMPAIRMENTS T0 WATER QUALITY	
Cause of Impairment	Percent
Nutrients	43.6
Sediment	22.2
Metals	9.5
Total Dissolved Solids	8.8
Habitat Alterations	8.2
Flow Alterations	6.4
Dissolved Oxygen	1.3

Table 12-6 SOURCES OF IMPAIRMENT TO WATER QUALITY	
Source of Impairment	Percent
Agriculture	45.0
Habitat Modification	10.9
Hydrologic Modification	10.2
Resource Extraction	9.4
Urban Runoff	8.4
Recreation	6.4
Others	6.2
Point Sources	3.5

Eighteen point sources, which include eight municipal sewage treatment plants, have discharges that enter Utah Lake and its tributaries. Those discharges contribute the largest percentage of phosphorus to the lake. Non-point sources of pollution which also contribute to the lake include agriculture, urban runoff, hydrologic modification, construction activities, recreation, habitat modification and natural background sources. Although the phosphorous concentrations in Utah Lake are of no direct health concern, it is the controlling factor in the eutrophic condition found in the system.

12.4.2 Groundwater

Most groundwater pollution is from natural geologic sources. Samples collected by the Division of Water Quality during 1989-1993 have shown significant nitrate concentrations in the Mapleton and Eureka areas. A possible source of the pollution near Mapleton is a nitric acid spill that occurred up-gradient at an explosives manufacturing site. Groundwater pollution at Eureka is likely originating from area mines. Nitrate concentrations are also a problem in Goshen Valley near Elberta, but the source has not been determined.

12.5 Alternative Solutions

The Division of Water Quality is implementing a watershed protection program in the Utah Lake and Jordan River Basins. It includes a high level of stake holder involvement, water quality monitoring and

information gathering, problem targeting and prioritization, and integrated solutions that use multiple agencies and groups.

An *EPA Clean Lakes Study, Phase I: Diagnostic/Feasibility Study for Utah Lake* was completed in 1996. Utah Lake is a hyper-eutrophic lake that is subject to excessive algae growth from year to year due to high levels of nutrients, primarily phosphorus, which enter the lake from mostly agricultural and municipal sources.

Water in Utah Lake is used for irrigation, fishing, boating, water supply, waterfowl, and may become a future source of drinking water as the population continues to grow along the Wasatch Front. As the lake begins to exhibit excessive algae and odor problems, recreators migrate to Deer Creek, Jordanelle and Strawberry reservoirs to seek a higher quality of water.

The clean lakes study identified possible reductions of phosphorus and the percent of reduction possible in each category as follows:

1. Modification to waste water treatment plant (65 percent reduction)
2. Urban runoff (10 percent reduction)
3. Animal Concentration (10 percent reduction)
4. Erosion and sediment control (10 percent reduction)

Estimated cost to carry out a significant water quality improvement program in Utah Lake is $228 million. It is not feasible at this time to initiate such an undertaking. Some work could be done in the watershed to improve water quality in the tributaries and protect the beneficial uses of those streams. Farmers and ranchers can change agricultural practices to minimize the animal waste entering streams. Stream bank erosion can be reduced. Information and education programs can be developed to teach the citizens about protecting water quality and thus reduce urban runoff pollution. Cities and counties can be zoned to protect water quality, and raise awareness of land developers about how construction activities can impact water quality.

A Utah Lake Steering Committee will continue to work on water quality issues of concern in the Utah Lake watershed. That committee will be under the direction of the Mountainland Association of Governments. Several technical advisory committees will support and report to the steering committee.

Funding was recently made available by the water districts and cities to look at a section of the Provo River between Murdock Diversion and Deer Creek Reservoir. A technical advisory committee has been formed to give guidance on dealing with increasing recreation use. Rapidly increasing traffic on the highway through this area is being investigated as a potential source of toxic chemical spills and other hazards. A similar group may be created to find solutions to similar problems in the Spanish Fork River watershed.

The Jordanelle/Deer Creek Water Quality Technical Advisory Committee is addressing problems associated with these two major reservoirs. The Tri-Valley Watershed, a PL-566 funded erosion control activity, will enable water quality studies and resource inventories. Upland and stream bank erosion, a significant source of sediment loading of the reservoirs, is being studied.

Wasatch County's general planning process, aided by urbanization, is reducing pollution. As dairy farmers have been crowded out of Heber Valley by urbanization, alfalfa production, along with phosphorus pollution, have decreased. Erosion from construction sites is one principal target of two new soil erosion ordinances.

12.6 Issues and Recommendations

Water quality issues are primarily associated with the continuing trend to convert agricultural land to urban uses. While reduction of the agricultural sector has reduced non-point source pollution, i.e. phosphorous, urbanization has led to increasing pollution from point sources.

12.6.1 Urbanization Impacts on Water Quality

Issue - Runoff from urbanizing areas contribute an increasing amount of pollutants to irrigation canals.

Discussion - This issue pertains to many canals, primarily in Utah and Wasatch counties. One in Utah County is discussed to provide an example. The Provo Reservoir Canal is 23 miles long. At the Jordan Narrows it delivers irrigation water to the Jacob and Welby canals and the Utah Lake Distributing Canal, and municipal water via the Jordan Aqueduct to the Salt Lake County Water Conservancy District. The Welby Canal and the Jordan Aqueduct convey water into Salt Lake County, while the Jacob Canal and South Branch of the Utah Lake Distributing Canal convey water to north Utah County west of the Jordan River. The Provo River Water Users Association operates and maintains

the Provo Reservoir Canal which is a Provo River Project facility. The Bureau of Reclamation holds title for the United States.

Over the past several years, lands adjacent to the canal have been undergoing a conversion from agricultural use and undeveloped hillsides to urban uses. The pace of this conversion has increased markedly in the past several years. With this urbanization, the bureau and the Provo River Water Users Association have noted a marked increase in the volume of storm water runoff, sediment deposition and other contaminants entering the canal.

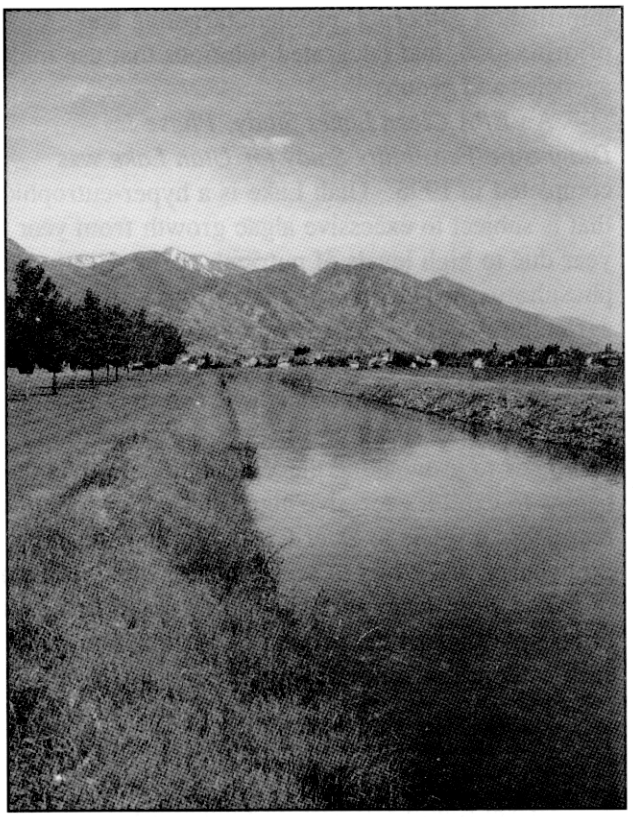
The authorized use of Provo River Project water is also changing from agricultural to culinary. Since 1974, water from the Provo Reservoir Canal has been diverted to the Salt Lake County Water Conservancy District for culinary use in communities in Salt Lake County. The bureau and water using entities now have the following concerns:

- Deterioration of water quality: Runoff entering the canal from urban areas is no longer considered non-point source discharge and is subject to regulation under the Clean Water Act. Cities that annex these formerly agricultural lands must make appropriate arrangements for storm water drainage. Urban runoff commonly contains oils and grease from city streets, nutrient from lawn fertilizers, industrial runoff, heavy metals, and pesticides.

- Structural integrity: Impervious surfaces encountered in urbanized watersheds cause more frequent runoff events and higher peak flows than agricultural watersheds. The Provo Reservoir Canal was not designed to handle the higher discharge volume experienced during major storm events. Runoff for a six hour, 100-year storm event from an orchard is negligible. Runoff from the same area and same event would be ½ inch under urban conditions.

- Increased operation and maintenance costs: Increased sediment from subdivision development intercepted by the canal decreases canal capacity and is costly to remove.

Because the Provo Reservoir Canal is a culinary water conveyance, the Bureau of Reclamation and the Provo River Water Users Association (PRWUA) will not accept storm water discharge from adjacent urban areas into the canal. Cities that have and are annexing formerly agricultural lands, are subject to the Clean Water Act and must arrange for storm water drainage from these lands. All existing discharge into the canal must be terminated and other arrangements made to provide for storm runoff prior to allowing urban development above the canal. The PRWUA's master plan calls for piping the entire 23-mile length of the canal to protect its water quality and reduce right-of-way conflicts and safety concerns.



Provo Reservoir Canal

With construction of the Daniels Replacement and Wasatch County Water Efficiency projects, many existing canals will be abandoned. These canals could act as a conduit for highly concentrated storm water to enter Deer Creek Reservoir.

Recommendation - Entities responsible for storm runoff should create urban storm drain utilities/districts with authority to protect all water supply canals, in particular, those carrying water for culinary uses. ✤ ✤